

NETTING CHUTES FOR MANUAL AND/OR AUTOMATED CLIPPING PACKAGING APPARATUS

Related Applications

This application claims the benefit of priority of U.S. Provisional Patent Serial
No. 60/508,609, filed October 3, 2003, the contents of which are hereby incorporated
5 by reference as if recited in full herein.

Field of the Invention

The present invention relates to apparatus that can enclose products in
packaging materials, and may be particularly suitable for enclosing products in
10 clippable netting material.

Background of the Invention

Certain types of commodity and/or industrial items can be packaged by
placing the desired product(s) in a covering material and then applying a closure clip
15 or clips to end portions of the covering material to secure the product(s) therein. For
non-flowable piece goods, the piece goods can be held individually in a respective
clipped package, or as a group of goods in a single package. The covering material
can be any suitable material, typically a casing and/or netting material.

Generally described, when packaging a piece good product in netting, the
20 product is pushed through a netting chute. The product can include, by way of
example, a non-flowable semi-solid and/or solid object such as a meat product
including whole or half hams, turkeys, chickens, and the like. The netting chute holds
a length of a netting sleeve over the exterior thereof. A first downstream end portion
of the netting is typically closed using a first clip. As the product exits the netting
25 chute, it is covered with the netting. The netting can be held relatively tight (typically
stretched or in tension) over the product. The open end of the netting (upstream of the
product) is then gathered and another clip can be applied to the gathered netting,
typically using a double clipper apparatus. A clip attachment apparatus or "clippers"
are well known to those of skill in the art and include those available from Tipper Tie,

Inc., of Apex, NC, under product numbers Z3214, Z3202, and Z3200. Examples of clip attachment apparatus and/or packaging apparatus are described in U.S. Patent Nos. 3,389,533; 3,499,259; 4,683,700; and 5,161,347, the contents of which are hereby incorporated by reference as if recited in full herein.

5 The double clipper concurrently applies two clips to the netting proximate the open (upstream) end of the package. One clip defines the leading end portion of the next package and the other defines the trailing or second end portion of the package then being closed. A cutting mechanism incorporated in the clipper apparatus can sever the two packages before the enclosed package is removed from the clipper
10 apparatus. U.S. Pat. No. 4,766,713 describes a double clipper apparatus used to apply two clips to a casing covering. U. S. Patent No. 5,495,701 proposes a clipper with a clip attachment mechanism configured to selectively fasten a single clip or two clips simultaneously.

15 Summary of Embodiments of the Invention

Embodiments of the present invention provide netting product chutes with non-circular cross-sectional cavities that can be used to automatically and/or manually package a product in a covering material to which clips may be applied thereto.

 In certain embodiments, the product can be manipulated and packaged so that
20 at least one clip is automatically applied to enclose the product in the covering material after it exits the product chute. Particular embodiments automatically introduce and/or push a discrete object or objects through the chute and into netting and then automatically clip the netting holding the enclosed product to thereby automatically package the product(s).

25 Some embodiments are directed to netting/product chutes having an outer wall defining an interior cavity extending therethrough, the outer wall including an exterior surface adapted to hold netting thereon, the chute having a cavity with a non-circular cross-section.

 In particular embodiments, the netting/product chute may include a
30 primary body and an entry segment attached thereto. The entry segment can have a flared portion with a first cross-sectional area that tapers into an adjacent downstream

portion proximate the primary body to have a smaller second cross-sectional area thereat. The chute may include a generally planar floor.

In some embodiments, the non-circular shape can be a generally pentagonal cross-sectional shape. In other embodiments the cavity cross-sectional shape
5 comprises an upper triangular portion. In yet other embodiments, the cavity cross-sectional shape is generally oval while in other embodiments the product chute has a cavity cross-sectional shape with a generally curvilinear upper portion that terminates into a generally planar lower floor portion.

Certain embodiments are directed to systems for enclosing a semi-solid or
10 solid product (or products) in a covering material. The systems include: (a) an elongate product chute having a generally planar floor, and an outer wall defining opposing receiving and discharge end portions and an interior cavity extending therethrough, the cavity having a non-circular cross-sectional shape; and (b) a clipper mechanism disposed downstream of the product chute. The clipper mechanism is
15 configured to apply at least one clip to a covering material that resides over and encloses a product discharged from the product chute.

Other embodiments are directed to methods of packaging an object or objects in netting. The methods include: (a) pushing at least one object through a product chute having a floor and a non-circular cross-sectional shape; (b) pulling netting
20 material downstream of the product chute off of an exterior surface of the product chute to automatically enclose the object in the netting material as the object exits the product chute; and then (c) applying at least one clip to the netting material to secure the object in the netting material.

These and other objects and/or aspects of the present invention are explained
25 in detail in the specification set forth below.

Brief Description of the Drawings

Figure 1 is a front perspective view of an apparatus/system used to automatically advance objects through a product chute and then automatically apply a
30 clip(s) via a clipper mechanism according to embodiments of the present invention.

Figures 2A-2D are front views of a manual packaging system illustrating a sequence of operations that can employ the netting chutes of the present invention according to embodiments of the present invention.

Figure 3 is a side perspective view of a product chute according to
5 embodiments of the present invention.

Figure 4 is a front view of the product chute shown in **Figure 3**.

Figure 5 is a rear view of the product chute shown in **Figure 3**.

Figure 6A is a side perspective view of the product chute shown in **Figure 3** illustrating an exemplary object therein in preparation for packaging with the product
10 chute held substantially horizontally during operation according to embodiments of the present invention.

Figure 6B is a side perspective view of the product chute shown in **Figure 3** with the product chute held tilted relative to horizontal during operation according to other embodiments of the present invention.

Figure 7 is a front perspective view of a product chute according to other
15 embodiments of the present invention.

Figure 8 is a front view of the product chute shown in **Figure 7**.

Figure 9 is a side perspective view of another product chute according to yet
other embodiments of the present invention.

Figure 10 is a side view of the product chute shown in **Figure 9**.
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Figure 11 is a front view of the product chute shown in **Figure 9**.

Figure 12 is a rear end view of the product chute shown in **Figure 9**.

Figure 13 is a side perspective view of another product chute according to
additional embodiments of the present invention.

Figure 14 is a side view of the product chute shown in **Figure 13**.
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Figure 15 is a front view of the product chute shown in **Figure 13**.

Figure 16 is a rear end view of the product chute shown in **Figure 13**.

Figure 17 is a side perspective view of the product chute shown in **Figure 13** with an exemplary object entering therein for packaging according to embodiments of
30 the present invention.

Description of Embodiments of the Invention

The present invention will now be described more fully hereinafter with reference to the accompanying figures, in which embodiments of the invention are shown. This invention may, however, be embodied in many different forms and should not be construed as limited to the embodiments set forth herein. Like numbers
5 refer to like elements throughout. In the figures, certain layers, components or features may be exaggerated for clarity, and broken lines illustrate optional features or operations, unless specified otherwise. In addition, the sequence of operations (or steps) is not limited to the order presented in the claims unless specifically indicated otherwise. Where used, the terms "attached", "connected", "contacting", "coupling"
10 and the like, can mean either directly or indirectly, unless stated otherwise. The term "concurrently" means that the operations are carried out substantially simultaneously. In addition, as used herein the term "and/or" includes any and all combinations of one or more of the associated listed items.

In the description of the present invention that follows, certain terms are
15 employed to refer to the positional relationship of certain structures relative to other structures. As used herein, the term "front" or "forward" and derivatives thereof refer to the general or primary direction that the product travels for packaging and closure; this term is intended to be synonymous with the term "downstream," which is often used in manufacturing or material flow environments to indicate that certain material
20 traveling or being acted upon is farther along in that process than other material. Conversely, the terms "rearward" and "upstream" and derivatives thereof refer to the directions opposite, respectively, the forward and downstream directions.

Embodiments of the present invention are particularly suitable for applying closure clips to discrete objects held in a covering material. The covering material
25 may be natural or synthetic and may be a casing material that can be sealed about a product or may be netting. The casing can be any suitable casing (edible or inedible, natural or synthetic) such as, but not limited to, collagen, cellulose, plastic, elastomeric or polymeric casing. The term "netting" refers to any open mesh material in any form including, for example, knotted, braided, extruded, stamped, knitted,
30 woven or otherwise. Typically, the netting is configured so as to be elastic and/or stretchable in both axial and lateral directions (isotropically elastic).

Netting or other covering material may be used to package discrete meat products such as loaves of meat, boned ham, spiral-sliced ham, deboned ham, turkey, turkey loaves held in molds, or other meat items; the packaging may be performed on the item or items alone or with the item or items held in subcontainers and/or wraps
5 such as molds, trays, boxes, bags, absorbent or protective sheets, sealant, cans and the like. Other embodiments of the present invention may be directed to package other types of food such as cheese, bread, fruit, vegetables, and the like. Examples of non-food items that may be packaged using embodiments of the present invention include living items such as flora, trees, and the like, as well as inanimate objects. Additional
10 examples of products include discrete, semi-solid or solid non-flowable objects such as firewood, pet food (typically held in a container if the wet type), recreational objects (such as balls), or other solid or semi-solid objects. The product may be a packaged for any suitable industry including horticulture, aquaculture, agriculture, or other food industry, environmental, chemical, explosive, or other application. Netting
15 may be particularly useful to package ham or turkeys, manufactured hardware such as automotive parts, firewood, explosives, molded products, and other industrial, consumable, and/or commodity item(s).

Generally stated, embodiments of the present invention are directed to the packaging of piece goods or discrete items by forcing them through a product chute, wrapping or enveloping the objects at the other end of the chute in a covering
20 material, such as netting, then clipping the covering material with a closure clip or other attachment means to close the covering and hold the object or objects inside of the covering material. As noted above, clippers are available from Tipper Tie, Inc., of Apex, North Carolina. Examples of suitable clips include metallic generally "U"-
25 shaped clips available from Tipper Tie, Inc., in Apex, North Carolina. Other clips, clip materials, and clip configurations or closure means may also be used.

Figure 1 illustrates an exemplary automatic clipping packaging apparatus **10** according to embodiments of the present invention. As shown, the apparatus **10** includes a product pusher assembly or mechanism **20**, a product chute **30**, and a
30 clipper **40**. It is noted that the clipper **40** may be referred to herein as a clipper apparatus, clipper mechanism, and/or clipper assembly, but each term may be used interchangeably with the others. As shown, the apparatus **10** may optionally include

an infeed conveyor **50**. In the embodiment shown, the apparatus **10** can be described as a horizontal automatic clipping packaging apparatus as the product is primarily moved, processed, clipped and packaged in a horizontal plane. However, certain components, features or operations may be oriented and/or carried out in other planes or directions and the present invention is not limited thereto. For example, the product chute **30** may be tilted from horizontal, typically so that the discharge or egress end **30d** is closer the ground than the product entry or ingress end **30e** (as generally illustrated by **Figure 6B**). The direction of travel of an exemplary product undergoing packaging is illustrated by the broken line arrows in this **Figure 1**. Non-automated systems may have a generally straight path axially aligned with that of the chute axis as is known to those of skill in the art.

This positioning of the product in the flow path and/or alignment with the product chute cavity **30c** can be carried out substantially automatically as will be discussed further below. However, a target product undergoing packaging can also be manually introduced or placed into the flow path and subsequently processed as in an automatic or manual in-feed operation.

In operation, the product pusher assembly **20** linearly retracts and advances to push a product through the product chute **30** so that the product is positioned proximate the clipper **40** and then retracts to a resting state upstream of the product transfer zone **60**. As described above, a sleeve of covering material **100c** (**Figure 2B**) can be positioned about the external surface of the product chute **30** and configured to be drawn downstream thereof so as to automatically encase the product as the product emerges from the discharge end **30d** of the product chute **30**. A supplemental sleeve material holder may also be used if desired instead of placing the sleeve of casing material on the product chute. The supplemental sleeve holder can be configured to surround a downstream portion of the product chute (not shown). The sleeve of covering material may be sized to stretch to substantially conform to the external wall or surface of the product chute **30** or may be more loosely held thereon. The cavity of the product chute **30c** may be sized to snugly contact or squeeze opposing portions of the product (side to side and/or top to bottom) as the product is pushed therethrough or may be oversized with respect to the product so that the product loosely travels therethrough.

In some embodiments, the shape, size and/or type of product can determine a suitable netting diameter to provide a desired tightness of netting and, hence, influence the product chute design factor.

In operation, the sleeve of covering material may be clipped, welded, fused, knotted or otherwise closed at a leading edge portion thereof. When the product exits the product chute 30, it is held in the covering material as the covering material is drawn downstream. The covering material is typically loaded onto the product chute 30 and the leading edge portion closed before the product chute 30 is mounted to the apparatus 10. Additional description of a suitable automatic apparatus is described in co-pending, co-assigned U.S. Provisional Patent Serial No. 60/508,609, filed October 3, 2003, the contents of which were incorporated by reference above.

Figures 2A-2D illustrate a manual or semi-manual system 11 with a series of operations that can be used to package a target product 100 or products using a product chute 30 and a desired covering material 100c. Figure 2D illustrates a clipped 100cl package of netting enclosing the product 100.

Figures 3-6B illustrate one embodiment of a product chute 30 that can be used with automatic and/or manual packaging systems. As shown, the product chute 30 includes an outer surface 30s, a cavity 30c, and a floor 30f. As shown, the floor 30f can be substantially planar and disposed at the lower portion of a curvilinear wall 30w. In certain embodiments, the chute 30 is configured so that the curvilinear wall 30w terminates or merges into the floor 30f to together define a non-circular cross-sectional shape of the cavity 30c.

Thus, the product chute 30 has a cross-sectional profile that is non-circular. As shown in Figure 4, the product chute 30 may be configured with a cavity 30c having a generally oval profile. In this embodiment, the cavity shape can be described as having a substantially planar bottom portion 30b, generally semi-circular side 30a portions, and a substantially planar upper portion 30u. Other cross-sectional profile configurations may also be used, including, but not limited to, circular, oval, triangular, rectangular, square and the like, and combinations thereof, examples of which will be described below.

As is also shown in Figures 3 and 4, the product chute 30 may include an outwardly flaring forwardmost edge portion 34 that gradually tapers into the primary

chute body. This flaring segment or portion **34** can be described as a funnel-like guide that may help direct objects into the primary body of the chute **30**. Thus, the product chute **30** can include a larger front-end cavity area relative to the intermediate and/or discharging portion **30d**, *i.e.*, the chute cavity **30c** narrows in the pushing/product travel direction. Thus, the product chute **30** can include a primary body and a larger upstream guide portion that narrows into the shape of the primary body.

The product chute **30** can include a handle **35** or other suitable gripping means thereon to facilitate operator handling. In addition, the product chute **30** may include a mounting bracket **36** that allows the chute **30** to be secured to a mounting frame during operation. In particular embodiments, the product chute **30** mounting bracket **36** is configured to releasably attach to a frame of an apparatus (such as that shown as reference number **10** in **Figure 1**). As shown in **Figures 3-6B**, the mounting bracket **36** can be configured with an axially extending finger bracket **37b** with at least one aperture **37** (shown as two) that can be used to hold a safety proximity or interlock sensor to inhibit operation of the clipping and/or product/pusher system when the product chute is not in proper position. An exemplary sensor is a two-part magnetic switch, one part of which can be positioned on chute bracket **37b** as shown in **Figure 3** and the other part held on a mounting frame that holds the chute **30**. When the two matable parts of the switch engage, the chute **30** is determined to be in proper position. Other types and/or additional sensors may also be used as suitable as is known to those of skill in the art.

In particular embodiments particularly suitable for automated systems **10** shown in **Figure 1**, when a product **100** is detected in the transfer zone **60**, the activation of the product pusher assembly **20** may be based on whether the product chute **30** is determined to be in proper position using data from the sensor held on bracket **37b** (**Figure 3**), and/or on a portion of the mounting frame holding the chute **30**. In operation, a controller/processor (such as a Programmable Logic Controller) may be configured to monitor a signal from the proximity sensor and deactivate the product pusher assembly (release cylinder pressure) automatically whenever a product chute **30** position-error is noted at any time during the process. The signal can be automatically monitored through a Safety Circuit Computer Module. If the product

chute 30 is missing or out of position, the apparatus 10 can be held in a low energy state that removes power to air supplies and controls to inhibit machine operation. To reinitiate the procedure, an operator may press a restart or reset button. In certain embodiments, the clipper 40 may be operated on override even when the chute 30 is absent. Once the product chute 30 is in location and the stop is reset, power air can be applied to the machine control valves and electric power can be applied to the control (PLC) outputs. After the PLC determines the positions of the moveable components, such as the product pusher assembly 20, the clipper 40, a product holding member (where used), and the like, an automatic reset can be performed and those components automatically moved to a respective home position as needed.

In operation, as shown in **Figure 6A**, a supply of covering material 100c can be placed on or about the chute 30, arranged to surround the exterior surface of at least a portion of the product chute 30 and stretch in tension in the downstream direction to cover the product 100 (tenting in the axial direction) as the product exits the discharge end portion of the product chute 30d. In certain embodiments, the covering material 100c is configured and sized to stretch in at least the lateral direction and typically in both the lateral and axial directions as it is held on and dispensed from the product chute 30. The covering (typically netting) can be pulled to package successive objects until the sleeve is depleted.

Figure 6A illustrates that the product chute 30 may be held substantially horizontal during operation. **Figure 6B** illustrates that the product chute may be held tilted with respect to horizontal during operation. The tilt may be selected so that the chute extends angularly down at between about 30-60 degrees.

Although the product chute 30 is shown as having a continuous outer surface or wall, other configurations may also be used. For example, the chute wall or walls may include a slot or apertures and may not be a closed configuration, typically depending on the application. However, the chute 30 should be configured to provide sufficient structural support for the covering material (typically sized and configured to hold the covering stretched in both lateral and longitudinal directions) and to allow the product to enter the product material as it exits the product chute 30.

Figures 7 and 8 illustrate another embodiment of a product chute 30. In this embodiment, the product chute 30 has a cavity that has a truncated circular profile.

As shown in **Figure 8**, the upper profile shape (when viewed from the end) is circular and is truncated by a generally planar floor **30f**. As before, the forwardmost entry portion **30e** can include a flared segment **34**.

Figures 9-12 illustrate yet another embodiment of a product chute **30**. As shown, the cavity **30c** has a profile that is a generally elongate flattened oval. In this embodiment, the oval shape is more compressed than that of **Figure 3**, with the cross-sectional shape of the cavity **30c** having shorter circular sides **30a** with relatively longer generally planar top and bottom segments **30u**, **30b**. However, similar to **Figure 3**, the upper and lower portions **30u**, **30b**, respectively, of the product chute **30** can be generally planar, while the opposing side portions **30a** are substantially semicircular (typically arcuate). Again, the forwardmost portion may include a flared entry segment **34**. However, in this embodiment, the flared segment **34** has a discontinuous perimeter. That is, the flared segment **34** is attached to the primary body of the chute **30** and defines a gap space **34g** proximate the floor **30f** of the entry portion of the product chute **30**.

Figure 10 illustrates that the discharge end **30d** of the chute **30** can be configured with an angular shape **39** when viewed from the side. This configuration can also apply to other chutes described herein (*see*, for example, **Figure 14**). The discharge end **30d** of the product chute may be configured so that a top axially extending length of the chute is shorter than a bottom axially extending length of the chute. As shown, the discharge end of the chute **30d** is angled from top to bottom, typically at about 10-45 degrees.

Figures 13-17 illustrate yet another embodiment of a chute **30** according to the present invention. As shown, the chute **30** includes a generally triangular upper portion **30t**. The generally pentagonal cross-sectional shape of the cavity **30c** is shown in **Figures 15** and **16**. As shown in **Figure 15**, when the chute is held horizontally, the upper generally triangulated portion **30t** merges into opposing substantially downwardly extending (shown as vertical) side segments **30v₁**, **30v₂**, which merge into a bottom **30b** substantially planar (shown as horizontal) floor segment **30f**.

The chute **30** may be formed as a unitary member or a series of attached members (not shown). In certain embodiments, the product chute body may include a

single continuous wall that defines the shape of the cavity **30c**. In other embodiments, the product chute body can be formed with a plurality of walls. In some embodiments, the product chute **30** is fabricated from stainless steel. The interior surface or portions thereof may be coated with an anti-stick coating and/or lubricant. For example, the interior of the chute **30** may comprise TEFLON® polymer. In particular embodiments, a single sheet of metal can be formed to provide the desired curvilinear product chute body shape (at least the upper portion above the floor).

The chutes **30** can vary in length depending on the target object or objects and the netting or covering material used, and the like. In particular embodiments, the chutes can have lengths of between about one (1) foot - eight (8) feet long, and more typically between about 2-6 feet long.

Although shown with a single object in a netting package, other embodiments of the invention use the product chutes **30** to package groups of objects (not shown).

The product chute floor **30f** may be a stationary floor as shown. However, it is also noted that the product chute **30** may include a moving floor. The chute **30** may be sized relative to the product **100** so that the product **100** extends across a major portion of the width of the cavity, and in certain embodiments, extends across at least about 75% of the width of the cavity. In certain embodiments, the product **100** and chute cavity **30c** are sized so that the sides and/or top and bottom of the product **100** are pressed against the sidewalls of the chute cavity as the product is pushed therethrough.

As described above, the product chute **30** can be configured to mount on a mounting bracket **36** that fits into a frame on such as apparatus **10, 11** (**Figures 1, 2**). **Figures 7-17** illustrate a mounting bracket **36** with a different configuration from that shown in **Figures 3-6B**. The bracket **36** shown in **Figures 3-6B** can include a planar platform **30b₁** (typically mounted substantially horizontal) that is connected to an upwardly extending segment **30b₂** (typically substantially vertical) with a recessed contour configured to receive the contour of the bottom of the product chute **30b₃**.

Figures 7-17 illustrate a substantially planar platform **30b₁'** that is attached to the planar bottom surface of a chute **30** and merges into a downwardly extending segment **30b₂'**.

In any event, the mounting bracket **36** can be configured to relatively easily attach to and be removed from the frame of the apparatus (such as **10, 11, Figures 1,2**) so as to be releasably mountable thereto. The mounting bracket **36** can hold the product chute **30** in alignment with the clipper mechanism **40** downstream and, where used, the product pusher mechanism **20** upstream. In certain embodiments, the system **10, 11** can include a first product chute and a respective first mounting bracket **36** and a second product chute **30** releasably mountable to the apparatus frame **10, 11** at the same position (interchangeable chutes) using a respective second mounting bracket **36** that can be configured substantially the same as the first mounting bracket **36**. In other embodiments, the product chute **30** can be lifted off of the mounting bracket **36** (leaving the mounting bracket in place) and another chute **30** placed thereon. The second product chute may be sized and configured the same as the first product chute **30** and loaded with a second supply of covering material. The covering material may be the same as that of the first product chute or different. Thus, the respective first and second mounting brackets **36** can be configured as quick disconnect components (merely loosening and/or releasing attachment hardware) to allow the first and second product chutes **30** to be interchanged on a system in under 5 minutes, and more typically in under about 2 minutes, to allow an operator to employ at least one of a different size product chute, a different configuration product chute, different packaging material dispensed by the product chute.

The foregoing is illustrative of the present invention and is not to be construed as limiting thereof. Although a few exemplary embodiments of this invention have been described, those skilled in the art will readily appreciate that many modifications are possible in the exemplary embodiments without materially departing from the novel teachings and advantages of this invention. Accordingly, all such modifications are intended to be included within the scope of this invention as defined in the claims. In the claims, means-plus-function clauses, where used, are intended to cover the structures described herein as performing the recited function and not only structural equivalents but also equivalent structures. Therefore, it is to be understood that the foregoing is illustrative of the present invention and is not to be construed as limited to the specific embodiments disclosed, and that modifications to the disclosed embodiments, as well as other embodiments, are intended to be included within the

scope of the appended claims. The invention is defined by the following claims, with equivalents of the claims to be included therein.